Porting the NetBeans Java 8 Enhanced For Loop Lambda Expression Refactoring to Eclipse

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Abstract:

Java 8 is one of the most significant upgrades to Java programming language and framework. This upgrade provided support for functional programming, a new JavaScript engine, new APIs for date time manipulation, a new streaming API, and so on. Among the new Java 8 features, lambda expressions are touted to be the most significant. Lambda expression simplify the development process by facilitating functional programming. Eclipse is one of the most popular IDEs for Java. While JDT UI has incorporated several Java 8 quick-fixes and refactoring's, there are still many features left to be done. For example, NetBeans has a refactoring that converts loops to lambda expressions. This project is for exploring the porting of such conversion mechanisms in NetBeans to Eclipse. These may be manifested as refactoring and/or quick-fixes. (http://openlab.citytech.cuny.edu/groups/port-netbeans-lambda-refactoring-to-eclipse)

Examples

```
List<String> list = Arrays.asList("Moe", "Larry", "Curly");

//Regular Enhance For Loop Conversion:
for (String s : list) System.out.println(s);

//Suggested Java 8 Lambda expression:
list.forEach(s -> System.out.println(s));

//Better yet:
list.forEach(System.out::println);

//It also should work with streams:
list.stream.forEach(System.out::println);
```

Motivation

- Lambda expression simplify the development process by facilitating functional programming.
- Lambda expressions provide concise ways to represent method interface and also make it easier to iterate through, filter, and extract data from Collection.
- Due to Java 8 upgrade some programming platform like tomcat, glassfish, groovy base on java need to be upgraded. According to Gyori et al. [1], making such changes manually would require changing approx. 1,700 line of non-commented, non-blank lines of code across approx. 100 files per project, on average. With our plug-in, Eclipse developers would not need to make these changes manually.

Eclipse Refactoring Life-Cycle

- Once a refactoring has been initiated, an implementer of that refactoring is used to coordinate condition checking, gathering details about the refactoring, and ultimately producing a series of changes that may be applied to the Eclipse workspace to accomplish the refactoring.
- This implementer must extend the abstract class org.eclipse.ltk.core.refactoring.Refactoring. The life-cycle for this class is shown in Figure 2.

```
Figure 2: Refactoring Life-Cycle[2]
```

JDT Type Hierarchy

```
Figure 4: Change Type Hierarchy[2]
```

FUTURE WORK:

- This is an on-going project and we will be working on it throughout the fall semester;
- We also plan to develop refactorings for Java 8 that do not currently exist in any IDE.

References:


IMPLICATION & PRECONDITIONS:

- The conversion must be semantics-preserving. That is the behavior of the program prior to the refactoring must match that of after the refactoring.
- The for loop must iterate over an instance of a Collection.
- The body of the initial for loop must not throw a checked exception.
- The body of the initial for loop must not have more than one reference to a local, non-effectively final variable defined outside the loop.
- The for loop body must not contain a break or continue statement as these semantics cannot be expressed via a lambda expression.

ACKNOWLEDGMENT:

We would like to thank Google Summer of Code, as well as the Eclipse Foundation, for their funding towards this project.

References: